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ABSTRACT

The NCHEMS Costing and Data Management System is designed to assist institutions in the implementation of cost studies. There are at least two kinds of cost studies: historical cost studies which display cost-related data that reflect actual events over a specific prior time period, and predictive cost studies which forecast costs that will be incurred during some future time period. These two kinds of cost studies use different techniques. Historical studies require the identification and aggregation of cost related data in terms of actual units (dollars, credit hours, and so forth). Predictive studies usually represent an institution in terms of historically derived parameters (such as average section size, faculty rank mix), which then are used as a basis for forecasting costs. NCHEMS Costing and Data Management System supports both historical and predictive cost studies--specifically, the cost study portion of the Information Exchange Procedures (IEP) and the Resource Requirements Prediction Model (RRPM 1.6). Contained in this report is a general description of the system (purpose, institutional information, structure, and capabilities), accounting information, personnel information, faculty activity information, student registration information, student outcomes information, data management (storage, display, calculation, allocation, unit costing) and other possible uses and definitions. (Author/PG)

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# AN INTRODUCTION TO THE NCHEMS COSTING AND DATA MANAGEMENT SYSTEM

Technical Report No. 55

by

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Ron Martin

January 1975

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National Center for Higher Education Management Systems at
Western Interstate Commission for Higher Education

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- facilitate exchange of comparable data among institutions.
- facilitate reporting of comparable information at the state and national levels.

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# PREFACE

This document describes the NCHEMS Costing and Data Management System. It explains the purpose and organization of the system and identifies the institutional information on which the system is based.

Other documents that may be used in conjunction with this document are:

An Introduction to the Resource Requirements Prediction Model 1.6, Technical Report No. 34A

Faculty Activity Analysis Procedures Manual, Technical Report No. 44

NCHEMS Costing and Data Management System--Sample Reports, Technical Report No. 56

Account Crossover Module Reference Manual, Technical Report No. 57

Faculty Activity Module Reference Manual, Technical Report No. 58

Personnel Data Module Reference Manual, Technical Report No. 59

Student Data Module Reference Manual, Technical Report No. 60

Student Outcomes Module Reference Manual, Technical Report No. 61

Data Management Module Reference Manual, Technical Report No. 62

IEP Structure, Technical Report No. 63

IEP Data Formats and Definitions, Technical Report No. 64

IEP Cost Study Procedures, Technical Report No. 65

IEP Outcomes, Procedures, Technical Report No. 66

ACKNOWLEDGMENTS

The design and documentation of a system of this size and complexity is the product of many individuals. Our thanks go to the many institutional personnel around the country who, through their comments and suggestions, helped formulate this system. We particularly thank those schools in the 1974 IEP Pilot Test for their assistance in tracking down and correcting software problems.

Several NCHEMS personnel have been especially helpful in designing and documenting this system. They include Dave Clark, Bill Collard, Gary Gamso, Bob Huff, and Dick Johnson.

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# GENERAL DESCRIPTION

## PURPOSE OF THE SYSTEM

The NCHEMS Costing and Data Management System is designed to assist institutions in the implementation of cost studies. There are at least two kinds of cost studies: historical cost studies display cost-related data that reflect actual events over a specified prior time period, and predictive cost studies forecast costs that will be incurred during some future time period. These two kinds of cost studies use different techniques. Historical studies require the identification and aggregation of cost-related data in terms of actual units (dollars, credit hours, and so forth). Predictive studies usually represent an institution in terms of historically derived parameters (such as average section size, faculty rank mix), which then are used as the basis for forecasting costs.

NCHEMS Costing and Data Management System supports both historical and predictive cost studies--specifically, the cost study portion of the Information Exchange Procedures (IEP) and the Resource Requirements Prediction Model (RRPM 1.6).

## INSTITUTIONAL INFORMATION

The Costing and Data Management System requires information about the institution using the system. Some or all of the following kinds of information will be required to implement this system for either Information Exchange Procedures or Resource Requirements Prediction Model purposes:

Student Registration Information

Student Outcomes Information

Personnel Information

Faculty Activity Information

Accounting Information

## STRUCTURE OF THE SYSTEM

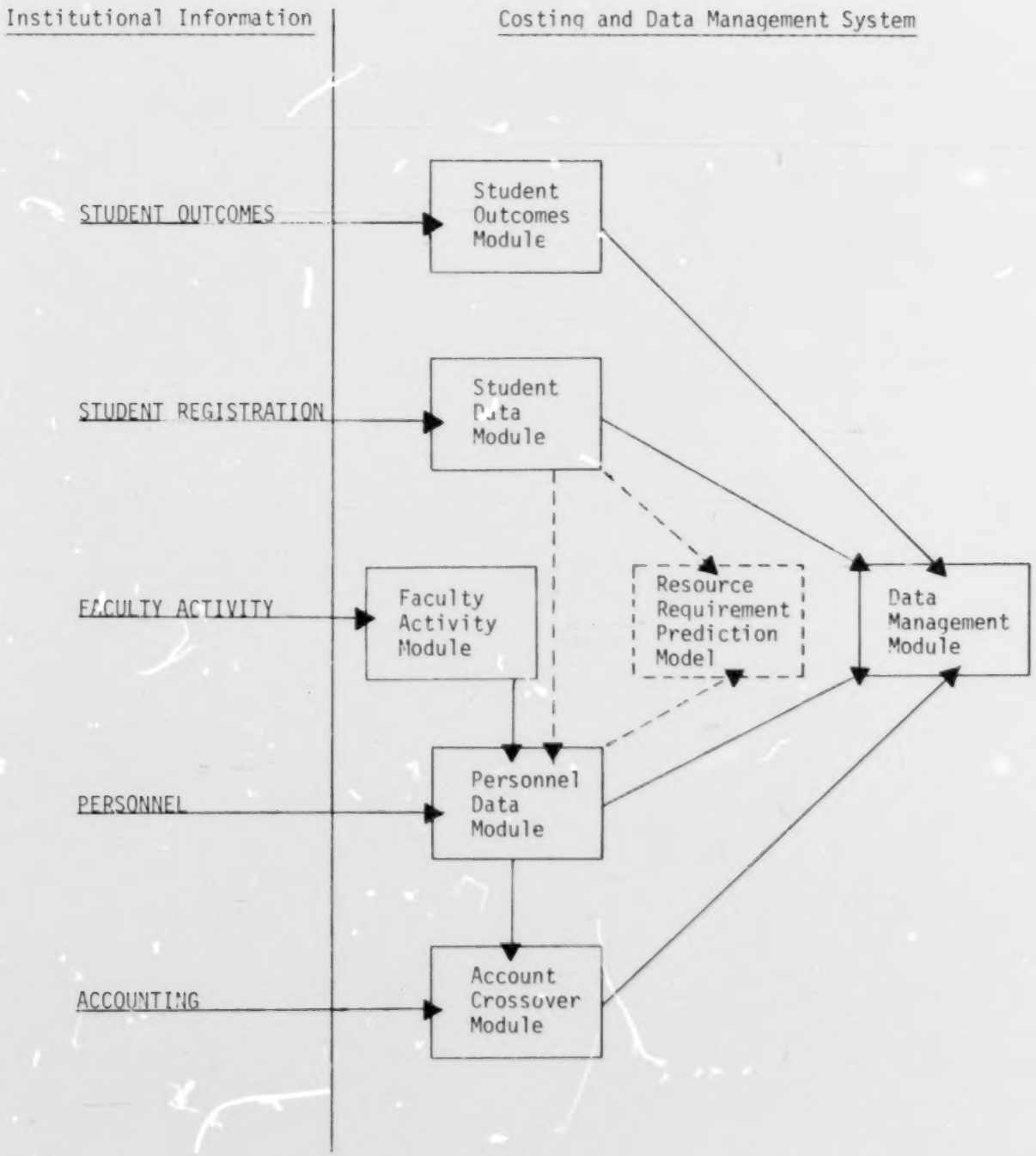
The Costing and Data Management System is modular in design. Each module may be used independent of all other modules, or each module may be used in conjunction with other modules or with the Resource Requirements Prediction Model. This modular design allows expansion of the system without requiring major modifications. A separate module processes each of the information types. The modules and the associated institutional information are:

| Modules | Associated Institutional Information |
|---|---|
| Student Data Module | Student Registration Information |
| Student Outcomes Module | Student Outcome Information |
| Personnel Data Module | Personnel Information |
| Faculty Activity Module | Faculty Activity Information |
| Account Crossover Module | Accounting Information |
| Data Management Module | Stores and manipulates information from the other modules |

Figure 1 shows each module's relationship to the system. Note that the Data Management Module does not directly accept institutional information, but rather is a storage and manipulation mechanism for information obtained from the other modules.

FIGURE 1

SYSTEM STRUCTURE



SYSTEM CAPABILITIES

This system is a tool in support of costing projects. The following capabilities are provided:

- Editing

  All institutional information is subjected to a detailed edit.

- Summarizing

  Summaries of student demand, faculty staffing, and departmental contribution are calculated.

- Manipulating

  Information may be scaled, weighted, and otherwise manipulated in many of the modules.

- Converting

  Some modules have the capability to convert unique institutional codes (such as major or discipline) into a uniform standard code (such as the HEGIS taxonomy).

- Reporting

  Each module produces reports displaying errors encountered as well as results of processing. The Data Management Module includes a limited report writer.

- Storing

  The system provides a generalized information storage capability.

The system is basically independent of NCHEMS definitions and structures. This allows the use of any structure, be it the NCHEMS Program Classification Structure (as in Information Exchange Procedures) or the institution's own accounting structure. Similarly, the institution's definition of direct cost can be used in lieu of the Information Exchange Procedures direct cost definition. The information storage mechanism in the Data Management Module has been designed also to allow institutional definitions. Therefore any information may be stored, regardless of any Information Exchange Procedures or Resource Requirements Prediction Model requirements.

## ACCOUNTING INFORMATION

Accounting information is processed by the Account Crossover Module. The Information Exchange Procedures cost study requires the realignment of institutional accounting information into the Information Exchange Procedures activity center structure. The Account Crossover Module provides that realignment (crossover) capability. This capability may be stated generally as the ability to cross over from any structure to any structure.

To execute an Information Exchange Procedures crossover, the institution must be able to identify what portion of each institutional account is to be crossed into each Information Exchange Procedures activity center. For example:

FIGURE 2

SAMPLE ACCOUNTING INFORMATION

| Institutional Account # | Expenditure Balance | Portion of Account | Information Exchange Procedures Activity Center |
|---|---|---|---|
| 10-251-04 Computer Center | $108,000 | 80% | 4.4 Academic Computing Support |
| | | 20% | 6.3 Administrative Computing Support |

The Account Crossover Module produces two reports. The first report, in institutional account number order, shows how each account was split among the Information Exchange Procedures activity centers. The second report, in Information Exchange Procedures activity center order, shows the institutional accounts that contributed to each Information Exchange Procedures activity center.

The Account Crossover Module accepts crossover instructions produced by the Personnel Data Module and produces information to be stored by the Data Management Module.

## PERSONNEL INFORMATION

Personnel information is processed by the Personnel Data Module. The primary function of the Personnel Data Module is to calculate crossover instructions to be used by the Account Crossover Module. This is done by linking personnel both to the accounts they are paid from and to the tasks they perform. Figure 3 illustrates the kinds of information needed.

FIGURE 3

SAMPLE PERSONNEL INFORMATION

| | Employee Number: 5807 |
|---|---|
| PAYROLL ACCOUNTS | AMOUNT |
| 10-941-18 | $15,000 |
| 11-941-18 | $ 3,000 |
| TASKS | |
| Teach Hist 305 | 3 Cr. Hr. Course |
| Teach Hist 100 | 2 Cr. Hr. Course |
| Research Project | ¼ Time |
| Library Administrator | ½ Time |

The Personnel Data Module produces four reports. The first report shows each person's tasks and the calculated compensation attached to each. The second report shows the institutional accounts that supported each task. The third report shows which tasks were supported by each institutional account. Finally, a report is produced showing the crossover instructions that will be forwarded to the Account Crossover Module.

The Personnel Data Module accepts information from the Student Data Module and the Faculty Activity Module, and forwards information to the Account Crossover Module, the Data Management Module, and the Resource Requirements Prediction Model.

## FACULTY ACTIVITY INFORMATION

Faculty activity information is processed by the Faculty Activity Module.

The Faculty Activity Module was designed to support the Faculty Activity Analysis project. The function of the Faculty Activity Module is to produce edited machine-readable versions of the Faculty Activity and Outcomes Survey instruments, suitable for further institutional processing. The Faculty Activity Module may be used additionally to produce the information needed for the Personnel Data Module. This does not preclude entering faculty activity information directly into the Personnel Data Module.

The Faculty Activity Module produces three reports. The first report shows a detailed tabulation of each individual faculty member's activity as recorded on the survey instrument. The second report shows departmental aggregations of faculty activity as reported on that instrument. The final report shows the data produced for the Personnel Data Module.

The Faculty Activity Module forwards information to the Personnel Data Module.

## STUDENT REGISTRATION INFORMATION

Student registration information is processed by the Student Data Module. The primary function of the Student Data Module is to produce a mechanism for translating discipline costs (cost per credit hour) into program costs (cost per student major). This mechanism is usually referred to as an Induced Course Load Matrix or an Instructional Workload Matrix.

To produce this mechanism, the institution must identify each student's major and level. Also, for each of the student's courses, the institution must identify the discipline, the course level, and the number of credit hours, as shown in Figure 4.

FIGURE 4

SAMPLE STUDENT REGISTRATION INFORMATION

| STUDENT'S MAJOR | STUDENT'S LEVEL | DISCIPLINE OF COURSE | COURSE LEVEL | CREDIT HOURS |
|---|---|---|---|---|
| CHEM | SOPH | MATH | FRESH | 5 |

The Student Data Module produces two reports. The first report, in student major order, shows the number of credit hours taken by each major from each discipline. The second report, in discipline order, shows the number of credit hours contributed by each discipline to each major.

The Student Data Module forwards information to the Personnel Data Module, the Data Management Module, and the Resource Requirements Prediction Module.

## STUDENT OUTCOMES INFORMATION

Student outcomes information is processed by the Student Outcomes Module. The primary function of the Student Outcomes Module is to convert data reported on the Student Outcomes Survey instrument into a form suitable for storage in the Data Management Module.

The Student Outcomes Module produces two reports. The first report is an edited tabulation of the responses of each student from the survey instrument. The second report is an aggregation of responses by student major.

The Student Outcomes Module forwards information to the Data Management Module.

## DATA MANAGEMENT

The Data Management Module has several clearly separated functions:

### STORAGE

The Data Management Module provides a flexible and easily expandable file maintenance system for storage of information collected by the Costing and Data Management System, as well as other institutional information.

### DISPLAY

Information may be extracted in both machine-readable and report form.

### CALCULATION

Calculation may be performed on the information stored within the Data Management Module. For example, allocated cost may be added to direct cost to produce full cost.

### ALLOCATION

Allocation is the process of spreading support costs across primary cost centers. For example, the costs of the library may be allocated to instruction, research, and public service costs.

UNIT COSTING

Unit costing is the calculation of cost per discipline credit hour and cost per student major.

## OTHER POSSIBLE USES AND DEFINITIONS

Although the Costing and Data Management System was produced to support the Information Exchange Procedures and the Resource Requirements Prediction Model, the system was designed with few restrictions regarding the kinds of data to be processed or the structure for arraying those data. For example, Information Exchange Procedures requires an Instructional Workload Matrix of semester credit hours by discipline and student major. However, the Student Data Module will construct an Instructional Workload Matrix of student contact hours (or any other measure) by department (or any other grouping) and ethnic group (or any other classification). Similarly, the Account Crossover Module will cross over account balances from institutional accounts to the Information Exchange Procedures activity structure, but the Account Crossover Module may be used to cross account balances (representing any units) from any structure to any structure.

Throughout this document, Information Exchange Procedures terminology and definitions have been used. However, many other definitions are possible. In the following examples the underlined Information Exchange Procedures term may be replaced as indicated:

Discipline may be any budgetary or organizational unit, such as department, division, school, college, course, or section.

Course Level may be any subset of Discipline, such as day or night courses, large or small courses, or major/service-oriented courses.

Student Major may be any homogeneous grouping of students, such as degree/nondegree program, field of study, or curricular path.

Student Level may be any subset of Student Major, such as full/part-time, age, ethnic group, or female/male.

Credit Hours may be any student-related unit, such as contact hours, institutional defined units, revenue/tuition, or outcome units.

Information Exchange Procedures Activity Center Structures may be any structure, such as the institutional chart of accounts or a state reporting structure.

Expenditure Balance may be any quantity, such as budgetary amount, revenue, or square feet.

This flexibility permits the use of institutional definitions and structures. Therefore, the Costing and Data Management System may be used in a number of areas such as personnel staffing, facilities, revenue, and student loading.

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